

## **Desk study for deposits of raw materials**

<b>1. INTRODUCTION .....</b>	<b>48</b>
<b>2. DESK STUDY .....</b>	<b>49</b>
2.1 Geological maps.....	49
2.2 Documents .....	52
2.3 Photogeology .....	52
2.4 Remote sensing .....	54
2.5 Where to look for information? .....	54
2.6 Results of the desk study .....	54

- ◆ Holderbank approach
- ◆ Desk study

## **1. INTRODUCTION**

In the following chapters, we will elaborate on the procedures developed especially for the exploration of raw materials for cement and aggregates. The proposed scheme is based on experience and modeled according to the needs of the cement industry. Of course, every exploration project is unique and requires a particular approach.

Basically, the scope and extent of every exploration procedure is governed by the following series of criteria:

- ◆ **Scope of work**
- ◆ **Status of geological knowledge of the area to be examined**
- ◆ **Raw materials: exposures, structures, overburden**
- ◆ **Time and financial resources available**
- ◆ **Climatic conditions**
- ◆ **Physiography and topography of the area**

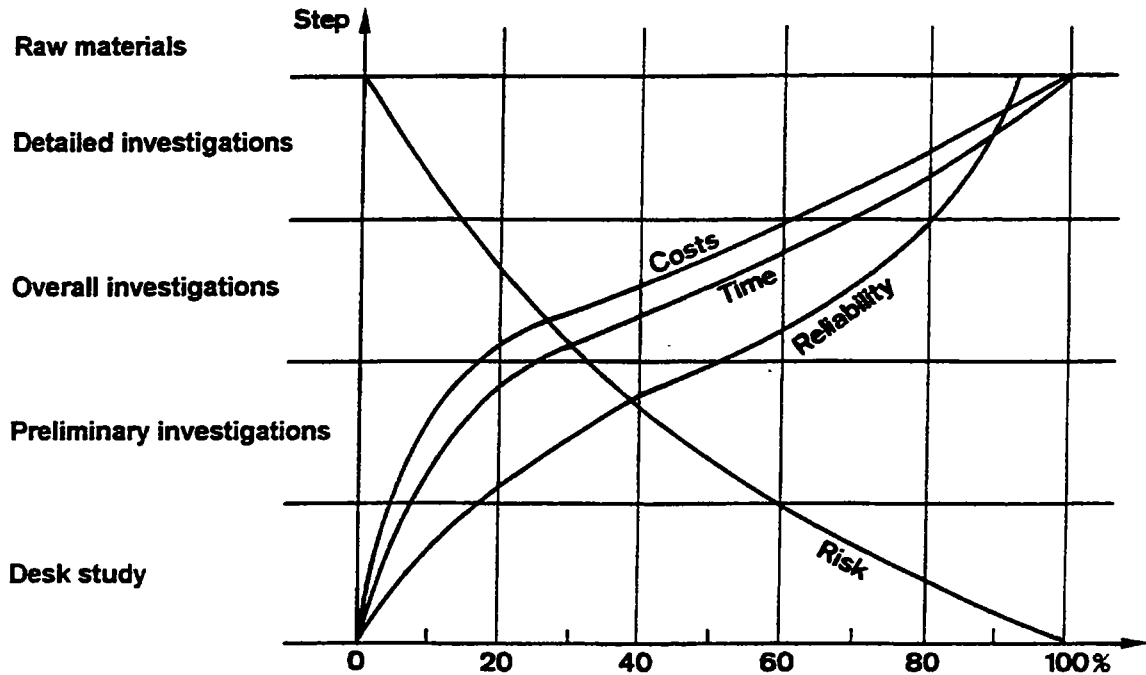
### **The Holderbank approach**

The deposits are investigated in a stepwise fashion from a general overview to more detailed exploration activities. Each step is defined with regard to the respective scope, extent, costs, time requirement, reliability of the results (error limits) and the development of risk.

In practice, the proposed procedure encompasses the following sequence of events:

- 1) Desk study
- 2) Preliminary prospecting of raw materials
- 3) Overall investigations of raw materials
- 4) Detailed investigations of raw materials

**Fig. 1** Shows the development of costs, time, reliability and risk during the investigations of raw materials.



## 2. DESK STUDY

Once the scope of work for required investigations has been agreed on and a quotation therefore accepted a fact finding study is conducted. This study, called a desk study, is carried out with the aim of gathering and evaluating all the available data and information.

In consideration of the cost, field work must be focused on selected areas. A successful exploration programme will therefore begin with a literature search and the geologist will look for the followings documents:

### 2.1 Geological maps

Scale 1:1'000'000 to 1:25'000 or larger scale if available. Such maps show the distribution of the stratigraphical units exposed in the considered region and the structures, i.e. style of deformation.

Interpretation of thematic maps such as hydrogeological, geotechnical or geophysical can give valuable information.

For example, the geological map of the north west sector of the Kingdom of Saudi Arabia (Fig. 2). The map depicts exposures of limestone and clay on the Red Sea coastal plain, and further inland an amphibolic schist within the metamorphic shield.

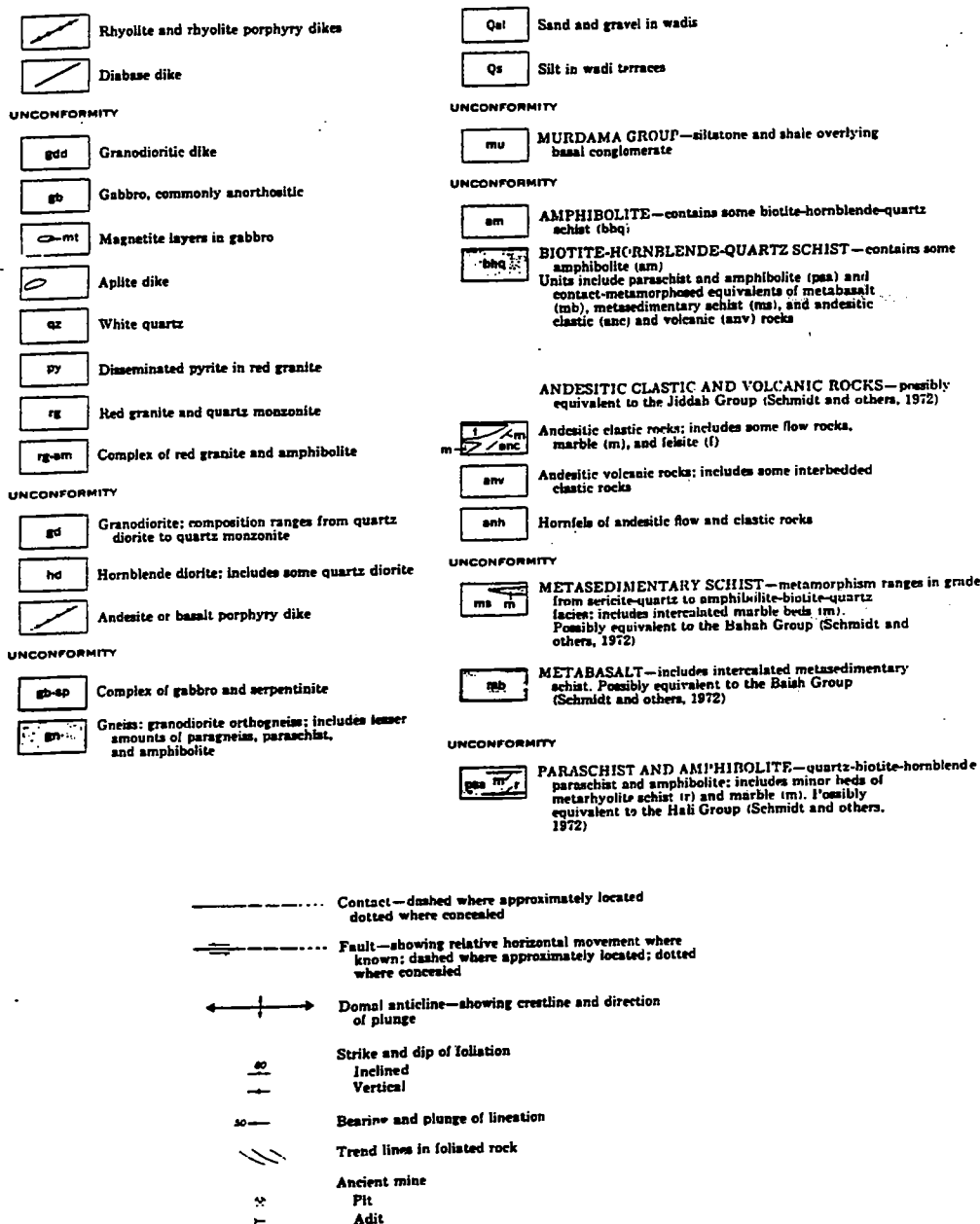
The map displays a complex geological landscape with various units and features. Key labels include:

- Geological Units:** Clay deposit, Limestone deposit, Amphibolitic schist.
- Place Names:** As Sawrah, Wadi Tiryān, Hala al Kalāwah, Al Muwayliḥ, Sharm al Barr, Sharm al Badī, Sharm al Jubayl, Ra's Mahārish, Ra's Dhahakān, Dubā, Ra's Abū Mas'rib, An Na'mān.
- Topographic Features:** Wadi Tiryān, Wadi al Kalāwah, Wadi al Muwayliḥ, Wadi al Badī, Wadi al Jubayl, Wadi al Dhahakān, Wadi al Na'mān.
- Grid and Scale:** A grid system is overlaid on the map, and a scale bar is provided in the bottom left corner.

Fig 2b

Legend for Figure 2a

DESCRIPTION OF MAP UNITS



## **2.2 Documents**

Documents describing the stratigraphy, (i.e. type of rocks, age, thickness, correlation between different units, variation of facies) and the lithology (i.e. composition of the rocks, the texture, the sedimentological structure) are very valuable to familiarise oneself with the regional geology.

The most detailed reports depict the distribution of the lithologies as well as the mineral and chemical compositions. Such reports or studies are normally done by students at the universities (diploma or PhD, professors). In addition existing company reports can give a lot of information. These are however not always available, whilst academic reports usually are.

## **2.3 Photogeology**

A considerable amount of geological information can be obtained from the interpretation of from aerial photographs. Different rock types can be identified because of their strong tonal and textural contrasts due to:

- ◆ erosion levels and patterns
- ◆ colour and reflectivity
- ◆ vegetation cover
- ◆ structure

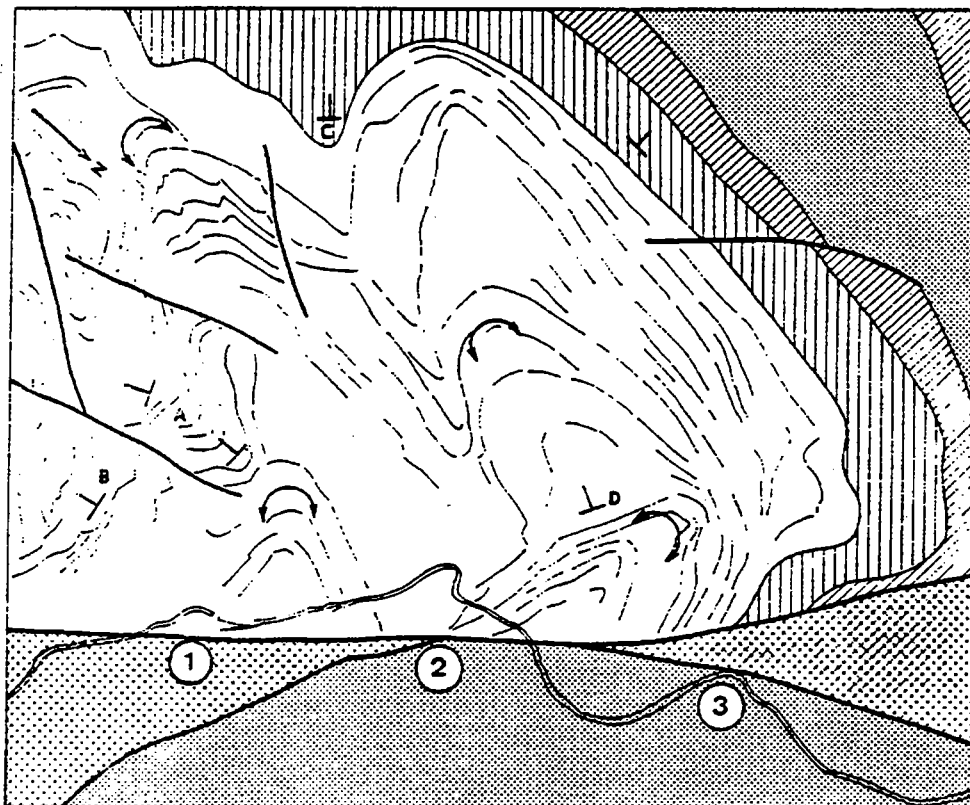
Lineaments (faults or other discontinuities) may be distinguishable as any alignment of features on an aerial photograph.

Folds are easily recognized and it is often possible to define the fold type (i.e. open, tight).

Fig. 3 shows a folded structure where it is possible to differentiate several lithologies. Dip and strike of the layers and fold axis can be determined.

From an aerial photograph, structure and a lithology can be quickly defined.

**Fig 3:** Aerial photograph of a folded region and geological interpretation



## **2.4 Remote sensing**

Apart from the traditionally used aerial photographs, the satellite pictures have become available as a useful tool for scanning large areas.

With the help of these pictures, the general trends of the regional geology and the lithology can be determined, which is very helpful for any prospecting campaign.

The technique employs devices such as cameras, lasers, infrared, and ultraviolet detectors in satellite or on aircraft.

The following tools are available :

<b>Tools</b>	<b>Resolution (pixels)</b>
Landsat MultiSpectral Scanner (MSS)	80 m
Landsat Thematic Mapper (TM)	30 m
SPOT MultiSpectral Scanner (SPOT-XS)	20 m
SPOT Panchromatic (SPOT-P)	10 m
ERS-1 (European Radar Satellite)	10 m
RadarSat	
Airborne Radar (Radar)	

Passive sensors like Landsat and SPOT can not see through clouds since they depend on naturally reflected or radiated energy. Only an active sensor, like radar, which emits a signal and records its reflection can penetrate clouds.

In heavily vegetated areas or in regions with high sun angles or with a low relief, the use of radar will significantly increase the visibility of the structure.

An example of prospecting for raw materials at Polpaico - Chile, by remote sensing, is given at the end of this chapter.

## **2.5 Where to look for information?**

- ◆ HMC Information Services
- ◆ University libraries
- ◆ Geological survey of the country

Aerial photographs can very often be obtained at the department of the geological survey.

## **2.6 Results of the desk study**

The result of the desk study must depict the geological situation of the most promising deposits.

The geologist will recommend carrying out preliminary field investigations on 2 to 3 deposits.